FORM-PTO-1390 (Rev. 12-29-99) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 027566-030

U.S. APPLICATION NO (If known, see 37 C.F.R 1.5): Unassigned 09/831824

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP99/08783	15 November 1999	16 November 1998

TITLE OF INVENTION: SIGNALLING IN A TELECOMMUNICATIONS SYSTEM

APPLICANT(S) FOR DO/EO/US: Leslie GRAF, Ian RYTINA and Christian GROVES

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and the PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

    Unexecuted Declaration and Preliminary Examination Report

JC18 Rec'd PCT/PTO 15 MAY 2001

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
Unassigned 09/831824	PCT/EP99/08783	027566-030

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1,000.00 (960)		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $860.00 (970)		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $710.00 (958)		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) $690.00 (956)		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00 (962)		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of **$130.00 (154)** for furnishing the oath or declaration later than 20 ☐ 30 ☐ months from the earliest claimed priority date (37 CFR 1.492(e)).	$ ---	

Claims	Number Filed	Number Extra	Rate		
Total Claims	5-20 =	0	X$18.00 (966)	$	- 0 -
Independent Claims	2 -3 =	0	X$80.00 (964)	$	- 0 -
Multiple dependent claim(s) (if applicable)			+$270.00 (968)	$	---
TOTAL OF ABOVE CALCULATIONS =				$	860.00
Reduction for 1/2 for filing by small entity, if applicable (see below).				$	---
SUBTOTAL =				$	860.00
Processing fee of **$130.00 (156)** for furnishing the English translation later than 20 ☐ 30 ☐ months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	---
TOTAL NATIONAL FEE =				$	860.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00 (581)** per property +				$	---
TOTAL FEES ENCLOSED =				$	860.00
				Amount to be: refunded	$
				charged	$

a. ☐ Small entity status is hereby claimed.

b. ☒ A check in the amount of $ 860.00 to cover the above fees is enclosed.

c. ☐ Please charge my Deposit Account No. 02-4800 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

d. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-4800. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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Signalling in a Telecommunications System

Field of the Invention

The present invention relates to signalling in a telecommunications system and more particularly to the transmission of signalling data over a packet switched network.

Background to the Invention

Conventional telecommunications networks for conveying voice and other user information have in general relied upon dedicated telecommunications network infrastructure and transmission protocols. However, with the recent explosive growth in digital data transmission, driven in particular by the use of intranets and the Internet, there has been a move towards the use of more generic infrastructure and transmission protocols in the telecommunications industry. This move is driven primarily by the desire for interoperability between telecommunications networks and other data networks, and secondarily by the cost and performance advantages which general data network systems offer over conventional telecommunications systems.

In 1996, the International Telecommunications Union (ITU) defined a standard for the transmission of multimedia data over Local Area Networks (LANs) as well as "internetworks" composed of multiple interconnected LANs. This standard is known as H.323, whilst the 1998 revision is known as H.323 Version 2. A fundamental and essential component of H.323 is the provision for the transmission of digitised and compressed voice data. However, H.323 also makes optional provision for the transmission of video and other data forms.

H.323 makes mandatory the use of the ITU standard Q.931 for the negotiation of a call set-up between two H.323 terminals, to establish a channel therebetween over which the terminals may send user and signalling data. In addition, Q.931 is mandatory for certain call maintenance and termination functions.

Perhaps the most advanced telecommunications network protocol is that known as International Standard Digital Network (ISDN). In the link between a subscriber and that subscriber's local exchange (the subscriber "access point"), ISDN uses a signalling protocol known as Digital Subscriber Signalling System No.1 (DSS1), whilst a further protocol known as ISDN User Part (ISUP) is used to convey signalling data within the network, i.e. inter-exchange signalling. ISUP is also used more generally in inter-exchange signalling even in networks which do not make use of an ISDN access network, e.g. where the access network is a Public Switched Telephone Network (PSTN)

In the current competitive telecommunications market, it is vital for a telecom operator to provide a wide and varied range of value added services, as well as to minimise the cost of services to the end users. As such, existing telecommunications network protocols, and in particular ISUP, have evolved to provide for the transfer of many messages and parameters relating to such services between the various nodes (or signalling points) of the networks.

As the Q.931 signalling protocol is largely based upon the DSS1 protocol, interworking between ISUP and H.323 is generally satisfactory. It is therefore possible to replace intermediate portions of an ISUP network with an H.323 network (or rather a TCP/IP network which uses the H.323 protocol). For example, the connection between two telephone switches, e.g. exchanges, could be made via an H.323 network.

Summary of the Present Invention

The inventors of the present invention have discovered that the existing Q.931 based signalling protocol employed by H.323 is not able to accommodate certain messages generated within an ISUP based network. More particularly, it has been discovered that the existing Q.931 based signalling protocol is unable to accommodate the Network Discard Indicator message which may be generated at a switch of a telecommunication network in the event that the switch does not support User-to-User signalling information contained in a received Q.931 message. This deficiency in the Q.931 based signalling protocol means that there is no way in which the switch, from which the User-to-User signalling information originated, can be informed for example that the receiving switch has discarded the signalling information. In certain circumstances this may lead to overcharging of the calling party.

It is an object of the present invention to overcome or at least mitigate the above noted disadvantages of existing telecommunication signalling systems. It is a further object of the present invention to provide a telecommunications system in which a packet switched network is used to carry user voice and data information and signalling data and in which a Network Discard Indicator message may be transmitted over the network between a pair of switches.

According to a first aspect of the present invention there is provided a method of communicating signalling data between a pair of telecommunication switches employing ISUP signalling, via a packet switched data network, the method comprising using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based

protocol extended to provide for the transmission of the ISUP Network Discard Indicator message.

Preferably, the extended Q.931 protocol employed by the present invention is arranged to be applied within an H.323 protocol stack. More preferably, said connection or part of a connection formed between the subscriber parties is provided over a TCP/IP based network. This network may be a LAN, an internetwork, the Internet, or a combination of two or more of these. In these cases, the H.323 protocol stack is provided over a TCP/IP protocol stack.

According to a second aspect of the present invention there is provided apparatus for communicating signalling data between a pair of telecommunication network switches employing ISUP signalling, via a packet switched data network, the apparatus comprising means for using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based protocol extended to provide for the transmission of Network Discard Indicator messages.

Brief Description of the Drawings

For a better understanding of the present invention and in order to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 illustrates schematically a telecommunications network in which user and signalling data is carried between exchanges of the network via an IP network; and

Figure 2 is a flow diagram illustrating the transmission of Network Discard Indicator messages in the network of Figure 1.

Detailed Description of Certain Embodiments

In the telecommunications network of Figure 1, a first telephone exchange 1 is coupled to a subscriber terminal 2 via an ISDN access network (i.e. which uses the DSS1 signalling protocol), whilst a second exchange 3 is coupled to a subscriber terminal 4 via a PSTN access network. Interexchange signalling within the network is carried using ISUP protocol messages requiring the provision at the PSTN exchange 3 of a PSTN/ISUP interface 5. In the case of a call between the two subscriber terminals 2,4, the terminal 2 from which the call is established is referred to as the "calling party" whilst the other terminal 4 is referred to as the "called party". It will also be appreciated that the terminals 2,4 may be connected to respective access exchanges 1,2 via intermediate routing nodes (e.g. multiplexers/demultiplexers).

The following description builds upon the disclosures of the ITU H.323 standard which makes mandatory the use of a Q.931 based standard for establishing and maintaining a call connection between two H.323 enabled terminals. In the example illustrated in Figure 1, the two exchanges 1,3 of the telecommunications network communicate via respective H.323 enabled terminals 6,7 which in turn communicate with each other over an IP based network 8. At the H.323 terminals 6,7, the H.323 protocol stacks lie on top of TCP/IP protocol layers such that the H.323 data may be conveyed between the exchanges over the IP network 8. Thus, at each exchange there exists a protocol stack consisting of ISUP over Q.931 over TCP/IP.

Consider the situation where the calling party 2 wishes to send certain User-to-User signalling information to the called party 4 during the call set-up procedure and which is facilitated by the ISDN access network available to the calling party 2. This information may include, for example, call forwarding information, call waiting information, or

the like. The information is encapsulated at the access exchange 1,6 in an appropriate Q.931 message and is sent over the H.323 network 8 to the terminating exchange 3,5,7. Now assume that the terminating exchange 3 is incapable of making use of the received User-to-User signalling information. In this case the terminating exchange 3 must generate a Network Discard Indicator message, encapsulate it within a Q.931 message, and transmit the resulting Q.931 message back to the originating exchange over the IP network 8.

The Q.931 standard defines a NOTIFY message having the following structure, where the Reference indicates the corresponding Information element reference in the Q.931 standard, Direction indicates the direction(s) in which an element may be carried by the NOTIFY message (n = network, u = H.323 user), and Length indicates the length of the element in octets:

Information element	Reference (subclause)	Direction	Type	Length
Protocol discriminator	4.2	Both	M	1
Call reference	4.3	Both	M	2
Message type	4.4	Both	M	1
Bearer capability	4.5	n → u	O	2-12
Notification indicator	4.5	Both	M	3
Display	4.5	n → u	O	≥2

Of the six message elements, the Notification Indicator element is defined in the existing Q.931 standard as having three meaningful values or states. These are:

Bits 7	6	5	4	3	2	1	
0	0	0	0	0	0	0	User suspended
0	0	0	0	0	0	1	User resumed
0	0	0	0	0	1	0	Bearer service change

All other values are currently reserved.

What is proposed here is an extension to the Q.931 protocol to provide for the Network Discard Indicator message. This message is assigned to any one of the reserved values of the Notification Indicator element.

Figure 2 is a flow chart illustrating the steps involved in relaying a Network Discard Indicator message from the PSTN exchange 3 to the ISDN exchange 1.

It will be appreciated by the person of skill in the art that various modifications may be made to the above described embodiment without departing from the scope of the present invention as defined by the appended claims. For example, whilst the above embodiment describes the inclusion of the Network Discard Indicator message in the Q.931 NOTIFY message, other messages may be used for which there currently exists reserved values. The exchanges (or switches) between which the Network Discard Indicator message is sent may be coupled via one or more intermediate switches, with the IP network extending only over an intermediate portion of the signalling connection, e.g. between two intermediate exchanges. In such a case, the Network Discard Indicator message may be generated either at the terminating or originating exchange, or at one of the intermediate exchanges. The Network Discard Indicator message may be placed directly onto the IP network by the exchange at which the message is generated, or it may first be transmitted to an intermediate exchange over, for example, a Signalling System No.7 (SS7) signalling network.

Claims

1. A method of communicating signalling data between a pair of telecommunication switches employing ISUP signalling, via a packet switched data network, the method comprising using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based protocol extended to provide for the transmission of the ISUP Network Discard Indicator message.

2. A method according to claim 1, wherein the extended Q.931 protocol is arranged to be applied within an H.323 protocol stack.

3. A method according to claim 2, wherein said connection or part of a connection formed between the subscriber parties is provided over a TCP/IP network.

4. A method according to claim 3, wherein the H.323 protocol stack is provided over a TCP/IP protocol stack.

5. Apparatus for communicating signalling data between a pair of telecommunication network switches employing ISUP signalling, via a packet switched data network, the apparatus comprising means for using H.323 protocol to communicate over the data network where signalling data is carried by a Q.931 based protocol extended to provide for the transmission of Network Discard Indicator messages.

1/1

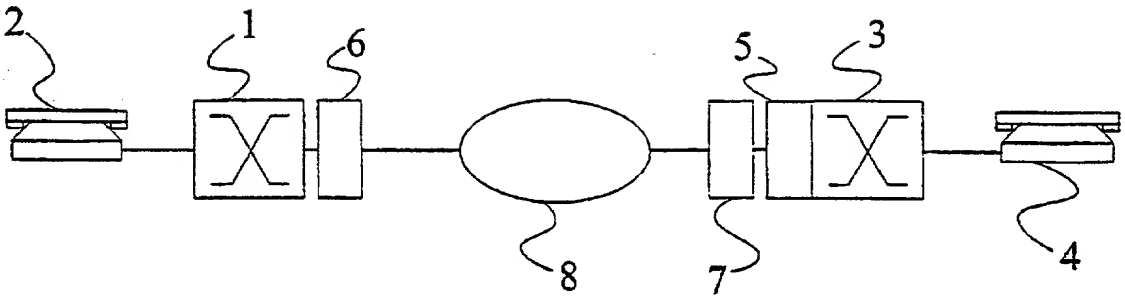
2
1
6
5
3
8
7
4

Fig. 1

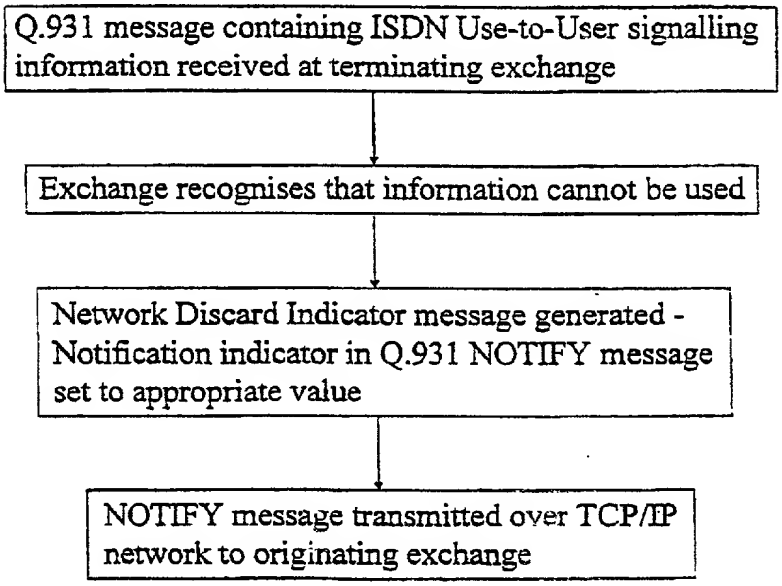
Q.931 message containing ISDN Use-to-User signalling information received at terminating exchange
Exchange recognises that information cannot be used
Network Discard Indicator message generated - Notification indicator in Q.931 NOTIFY message set to appropriate value
NOTIFY message transmitted over TCP/IP network to originating exchange

Fig. 2

Lmf 98118
8K25 PC-US

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY **(Includes Reference to Provisional and PCT International Applications)**	Attorney's Docket No. 027566-030

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name;
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SIGNALLING IN A TELECOMMUNICATIONS SYSTEM

the specification of which (check only one item below):

☐ is attached hereto.

☐ was filed as United States application
Number _____
on _____
and was amended
on _____ (if applicable).

☒ was filed as PCT international application
Number PCT/EP99/08783
on 15 November 1999
and was amended
on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(e) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. §119:

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. §119
Finland	982472	16 November 1998	X Yes _ No
			_ Yes _ No
			_ Yes _ No
			_ Yes _ No
			_ Yes _ No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

_____ _____
(Application Number) (Filing Date)

_____ _____
(Application Number) (Filing Date)

(05/01)

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONT'D) (Includes Reference to Provisional and PCT International Applications)	Attorney's Docket No. 027566-030

I hereby claim the benefit under Title 35, United States Code, §120 of any United States applications(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose to the Office all information known to me to be material to the patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. §120:

U.S. APPLICATIONS		STATUS *(check one)*		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. APPLICATION NUMBERS ASSIGNED (if any)			

I hereby appoint the following attorneys and agent(s) to prosecute said application and to transact all business in the Patent and Trademark Office connected therewith and to file, prosecute and to transact all business in connection with international applications directed to said invention:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONT'D) (Includes Reference to Provisional and PCT International Applications)	Attorney's Docket No. 027566-030

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RESIDENCE		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF SIXTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF SEVENTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF EIGHTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE		CITIZENSHIP
POST OFFICE ADDRESS		